IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Gunter KASTINGER

Serial No. 10/088,909

Based on PCT/DE 01/02668

For: UNIPOLAR TRANSVERSAL FLUX MACHINE

SUPPLEMENTAL PRELIMINARY AMENDMENT

Commissioner for Patents
Washington, D.C. 20231

Sir:

Prior to examination, please amend the above identified application as follows:

IN THE TITLE:

Page 1, Replace the Title of the Invention with the following rewritten Title:

--UNIPOLAR TRANSVERSE FLUX MACHINE--

IN THE SPECIFICATION:

Replace Paragraph [0002] with the following rewritten paragraph:

[0002] The invention is directed to an improved unipolar transverse flux machine.

Replace Paragraph [0003] with the following rewritten paragraph:

[0003] In a unipolar transverse flux machine of this kind (DE 100 21 914.4), it has already been proposed to embody the stator winding as an annular coil, which is disposed coaxial to the rotor axis and which, on the outside of the yoke elements remote from the rotor axis, passes through the yoke legs of the stator yoke. As a result, the machine can be one-stranded, i.e. can be embodied with one stator module and one rotor module, or can be multi-stranded, with at least two stator modules and rotor

modules, where each of the stator modules disposed axially adjacent to each other has an annular coil of this kind. In the two-strand design, the stator modules or rotor modules are disposed electrically offset from each other by at least 90° and the annular coils are supplied with current pulses in a bipolar fashion as a function of the rotation angle of the rotor.

Page 2, Replace Paragraph [0006] with the following rewritten paragraph:

[0006] The unipolar transverse flux machine according to the invention has the advantage of an extremely flat design and a definite start in a particular direction, which is assured by the two-strand design of the stator.

Replace Paragraph [0010] with the following rewritten paragraph:

[0010] Fig. 1 is a perspective depiction of a unipolar transverse flux motor,

Page 3, Replace Paragraph [0014] with the following rewritten paragraph:

[0014] The unipolar transverse flux motor shown in various views and sections in the drawings as an exemplary embodiment of a universal unipolar transverse flux machine has a stator 11 and a rotor 12, which rotates inside the stator 11 and is non-rotatably supported on a rotor shaft 13.

IN THE CLAIMS:

Please Amend Claim 14 as follows:

14. (Amended) A unipolar transverse flux machine, in particular a unipolar transverse flux motor, comprising

a rotor (12), which is non-rotatably supported on a rotor shaft (13) and is comprised of two coaxial ferromagnetic rotor rings (14, 15), which on their outer circumference remote from the rotor shaft (13), are provided with constant tooth spacing, and having a permanent magnet ring (16), which is magnetized in an axially unipolar fashion and is clamped axially between the rotor rings (14, 15), and

a stator (11), which is concentric to the rotor shaft (13) and has U-shaped stator yokes (19) with two yoke legs (191, 192) that are connected to each other by a crosspiece (193), which stator yokes (19) are fixed to a housing (10) with a spacing that corresponds to the tooth spacing, and are disposed so that the one yoke leg (191) is disposed opposite the one rotor ring (14) and the other yoke leg (192) is disposed opposite the other rotor ring (15), each with a radial gap distance, yoke elements (20), each of which is disposed between respective stator yokes (19) arranged one after the other in the rotation direction of the rotor (12), extends axially over the two rotor rings (14, 15), and is disposed opposite them with a radial gap distance, and a stator winding (21),

the stator winding (21) having two coils (22, 23), each with two coil sides (221, 222 or 231, 232), whose one coil side (221 or 231) extends coaxial to the rotor shaft (13), respectively over a group of stator yokes (19) and yoke elements (20) arranged in succession in the circumference direction, along the side of the yoke elements (20)

remote from the rotor shaft (13), between the yoke legs (191, 192), and wherein the group spanned by the coil side (221) of the one coil (22) is disposed spatially offset on the stator circumference and electrically offset by 90° in relation to the group spanned by the coil side (231) of the other coil (23).

IN THE ABSTRACT:

Replace the attached Abstract of the Disclosure with the Abstract of the Disclosure as originally filed.

REMARKS

The above amendments are being made to place the application in better condition for examination.

Entry of the amendment is respectfully solicited.

Respectfully submitted,

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DATE: July 10, 2002

ABSTRACT OF THE DISCLOSURE

In a unipolar transverse flux machine, in particular a motor, having a rotor, which is comprised of two coaxial, ferromagnetic, toothed rotor rings, and a permanent magnet ring, which is magnetized in an axially unipolar fashion and is clamped axially between these rotor rings, and having a stator, which is concentric to the rotor shaft and has U-shaped stator yokes that represent the magnet poles, yoke elements, and a stator winding, in order to achieve an extremely flat design and to assure a definite start in a particular direction, the stator winding is embodied with two coils, whose one coil side extends respectively over a group of stator yokes and yoke elements arranged in succession in the circumference direction, along the side of the yoke elements remote from the rotor shaft, between the yoke legs, where the group spanned by the coil side of the one coil is disposed spatially offset on the stator circumference and electrically offset by 90° in relation to the group spanned by the coil side of the other coil.

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE TITLE:

Page 1, The Title of the Invention has been amended as follows:

--UNIPOLAR [TRANSVERSAL] TRANSVERSE FLUX MACHINE--

IN THE SPECIFICATION:

Paragraph [0002] has been amended as follows:

[0002] The invention is directed to an improved unipolar [transversal] transverse flux machine.

Paragraph [0003] has been amended as follows:

[0003] In a unipolar [transversal] transverse flux machine of this kind (DE 100 21 914.4), it has already been proposed to embody the stator winding as an annular coil, which is disposed coaxial to the rotor axis and which, on the outside of the yoke elements remote from the rotor axis, passes through the yoke legs of the stator yoke. As a result, the machine can be one-stranded, i.e. can be embodied with one stator module and one rotor module, or can be multi-stranded, with at least two stator modules and rotor modules, where each of the stator modules disposed axially adjacent to each other has an annular coil of this kind. In the two-strand design, the stator modules or rotor modules are disposed electrically offset from each other by at least 90° and the annular coils are supplied with current pulses in a bipolar fashion as a function of the rotation angle of the rotor.

Page 2, Paragraph [0006] has been amended as follows:

[0006] The unipolar **[**transversal**]** transverse flux machine according to the invention has the advantage of an extremely flat design and a definite start in a particular direction, which is assured by the two-strand design of the stator.

Paragraph [0010] has been amended as follows:

[0010] Fig. 1 is a perspective depiction of a unipolar **[**transversal**]** transverse flux motor,

Page 3, Paragraph [0014] has been amended as follows:

[0014] The unipolar **[**transversal**]** transversal flux motor shown in various views and sections in the drawings as an exemplary embodiment of a universal unipolar **[**transversal**]** transversal flux machine has a stator 11 and a rotor 12, which rotates inside the stator 11 and is non-rotatably supported on a rotor shaft 13.

IN THE CLAIMS:

Claim 14 has been amended as follows:

14. (Amended) A unipolar **[**transversal**]** transverse flux machine, in particular a unipolar **[**transversal**]** transverse flux motor, comprising

a rotor (12), which is non-rotatably supported on a rotor shaft (13) and is comprised of two coaxial ferromagnetic rotor rings (14, 15), which on their outer circumference remote from the rotor shaft (13), are provided with constant tooth spacing, and having a permanent magnet ring (16), which is magnetized in an axially unipolar fashion and is clamped axially between the rotor rings (14, 15), and

a stator (11), which is concentric to the rotor shaft (13) and has U-shaped stator yokes (19) with two yoke legs (191, 192) that are connected to each other by a crosspiece (193), which stator yokes (19) are fixed to a housing (10) with a spacing that corresponds to the tooth spacing, and are disposed so that the one yoke leg (191) is disposed opposite the one rotor ring (14) and the other yoke leg (192) is disposed opposite the other rotor ring (15), each with a radial gap distance, yoke elements (20), each of which is disposed between respective stator yokes (19) arranged one after the other in the rotation direction of the rotor (12), extends axially over the two rotor rings (14, 15), and is disposed opposite them with a radial gap distance, and a stator winding (21),

the stator winding (21) having two coils (22, 23), each with two coil sides (221, 222 or 231, 232), whose one coil side (221 or 231) extends coaxial to the rotor shaft (13), respectively over a group of stator yokes (19) and yoke elements (20) arranged in succession in the circumference direction, along the side of the yoke elements (20)

remote from the rotor shaft (13), between the yoke legs (191, 192), and wherein the group spanned by the coil side (221) of the one coil (22) is disposed spatially offset on the stator circumference and electrically offset by 90° in relation to the group spanned by the coil side (231) of the other coil (23).

Page 12, The Abstract of the Disclosure has been amended as follows:

ABSTRACT OF THE DISCLOSURE

In a unipolar [transversal] transverse flux machine, in particular a motor, having a rotor, which is comprised of two coaxial, ferromagnetic, toothed rotor rings, and a permanent magnet ring, which is magnetized in an axially unipolar fashion and is clamped axially between these rotor rings, and having a stator, which is concentric to the rotor shaft and has U-shaped stator yokes that represent the magnet poles, yoke elements, and a stator winding, in order to achieve an extremely flat design and to assure a definite start in a particular direction, the stator winding is embodied with two coils, whose one coil side extends respectively over a group of stator yokes and yoke elements arranged in succession in the circumference direction, along the side of the yoke elements remote from the rotor shaft, between the yoke legs, where the group spanned by the coil side of the one coil is disposed spatially offset on the stator circumference and electrically offset by 90° in relation to the group spanned by the coil side of the other coil.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Guenter Kastinger

Based on PCT/DE 01/02668

For: Unipolar Transversal Flux Machine

PRELIMINARY AMENDMENT

Commissioner for Patents and Trademarks
Washington, D.C. 20231

Sir:

Prior to examination, please amend the above-identified application as follows:

IN THE SPECIFICATION

Page 1, between the title and paragraph [0001], insert the following:

[0000.2] CROSS-REFERENCE TO RELATED APPLICATIONS

[0000.4] This application is a 35 USC 371 application of PCT/DE 01/02668 filed on July 17, 2001.

[0000.6] BACKGROUND OF THE INVENTION

replace paragraph [0001] with the following amended paragraph:

[0001] Field of the Invention

replace paragraph [0002] with the following amended paragraph:

[0002] The invention is directed to an improved unipolar transversal flux machine.

between paragraph [0002] and [0003], insert the following:

[0002.5] DESCRIPTION OF THE PRIOR ART

Page 2, replace paragraph [0005] with the following amended paragraph:

[0005] SUMMARY OF THE INVENTION

delete paragraph [0007];

replace paragraph [0008] with the following amended paragraph:

[0008] BRIEF DESCRIPTION OF THE DRAWINGS

replace paragraph [0009] with the following amended paragraph:

[0009] An exemplary embodiment of the invention will be explained in detail in the description that follows, taken with the drawings, in which:

Page 3, replace paragraph [0013] with the following amended paragraph:

[0013] DESCRIPTION OF THE PREFERRED EMBODIMENT

Page 5, replace paragraph [0017] with the following amended paragraph:

[0017] The stator winding 21 is comprised of two identical coils 22, 23, in this case kidney-shaped ones (Fig. 1), each with two coil sides 221, 222 and 231, 232. The one coil side 221 or 231 of each coil 22 or 23 extends coaxial to the rotor axis or the rotor shaft 13 and extends over a group of stator yokes 19 and yoke elements 20 arranged in succession in the circumference direction, where the coil side 221 or 231, on the side of the yoke elements 20 remote from the rotor shaft 13, extends through between the yoke legs 191 and 192 of the stator yokes 19. Each group has an equal number of stator yokes 19 and yoke elements 20 arranged in succession in

the circumference direction, which in the exemplary embodiment totals six stator yokes 19 and six yoke elements 20. In this connection, the upper group spanned by the coil side 221 of the coil 22 is disposed electrically offset by 90° at the circumference in relation to the lower group spanned by the coil side 231 of the coil 23, each group containing a total of twelve stator yokes 19 and yoke elements 20. In Fig. 1, this is shown by the fact that the yoke elements 20 of the lower group spanned by the coil side 231 are radially aligned with the teeth 18 of the rotor 12, while the yoke elements 20 in the upper group spanned by the coil side 221 are offset in the circumference direction from the teeth 18 of the rotor 12. With a tooth count of sixteen and therefore a tooth division of 22.5°, the offset of the two groups of stator yokes 19 and yoke elements 20 in relation to each other is 5.626° of circumference angle. The other coil side 222 or 232 of the coil 22 or 23, on the outside of the stator yokes 19 remote from the rotor shaft 13, extends over their crosspieces 193, likewise coaxial to the rotor shaft 13, and is shaped like a segment of a circle, the same as the coil sides 221 and 231.

Page 7, insert the following new paragraph:

[0020] The foregoing relates to preferred exemplary embodiments of the invention, it being understood that other variants and embodiments thereof are possible within the spirit and scope of the invention, the latter being defined by the appended claims.

Page 8, delete "Claims" and insert --I Claim--.

IN THE CLAIMS

Please cancel claims 1-13 and add new claims 14-29.

14. A unipolar transversal flux machine, in particular a unipolar transversal flux motor, comprising

a rotor (12), which is non-rotatably supported on a rotor shaft (13) and is comprised of two coaxial ferromagnetic rotor rings (14, 15), which on their outer circumference remote from the rotor shaft (13), are provided with constant tooth spacing, and having a permanent magnet ring (16), which is magnetized in an axially unipolar fashion and is clamped axially between the rotor rings (14, 15), and

a stator (11), which is concentric to the rotor shaft (13) and has U-shaped stator yokes (19) with two yoke legs (191, 192) that are connected to each other by a crosspiece (193), which stator yokes (19) are fixed to a housing (10) with a spacing that corresponds to the tooth spacing, and are disposed so that the one yoke leg (191) is disposed opposite the one rotor ring (14) and the other yoke leg (192) is disposed opposite the other rotor ring (15), each with a radial gap distance, yoke elements (20), each of which is disposed between respective stator yokes (19) arranged one after the other in the rotation direction of the rotor (12), extends axially over the two rotor rings (14, 15), and is disposed opposite them with a radial gap distance, and a stator winding (21),

the stator winding (21) having two coils (22, 23), each with two coil sides (221, 222 or 231, 232), whose one coil side (221 or 231) extends coaxial to the rotor shaft (13), respectively over a group of stator yokes (19) and yoke elements (20) arranged in succession in the circumference direction, along the side of the yoke elements (20) remote from the rotor shaft (13), between the yoke legs (191, 192), and wherein

the group spanned by the coil side (221) of the one coil (22) is disposed spatially offset on the stator circumference and electrically offset by 90° in relation to the group spanned by the coil side (231) of the other coil (23).

15. The machine according to claim 14, wherein the other coil side (222 or 232) of the two coils (22, 23) extends on the outside of the crosspieces (193) of the stator yokes (19), remote from the rotor shaft (13).

16. The machine according to claim 14, wherein each group has an equal number of stator yokes (19) and yoke elements (20) arranged in succession in the circumference direction.

17. The machine according to claim 15, wherein each group has an equal number of stator yokes (19) and yoke elements (20) arranged in succession in the circumference direction.

18. The machine according to 14, wherein the total number of stator yokes (19) spanned by the one coil sides (221, 231) of the two coils (22, 23) is less than the greatest possible number of stator yokes (19) based on the tooth spacing or yoke spacing.

19. The machine according to 15, wherein the total number of stator yokes (19) spanned by the one coil sides (221, 231) of the two coils (22, 23) is less than the greatest possible number of stator yokes (19) based on the tooth spacing or yoke spacing.

20. The machine according to 14, wherein the two coils (22, 23) are supplied with current pulses in a bipolar fashion as a function of the rotation angle (θ) of the rotor (12), and that the current pulses in the coils (22, 23) are phase-shifted in relation to each other, in particular by 90°.

21. The machine according to 15, wherein the two coils (22, 23) are supplied with current pulses in a bipolar fashion as a function of the rotation angle (θ) of the rotor (12), and that the current pulses in the coils (22, 23) are phase-shifted in relation to each other, in particular by 90°.

22. The machine according to claim 14, wherein the stator yokes (19), the yoke elements (20), and the rotor rings (14, 15) are laminate.

23. The machine according to claim 14, wherein the yoke elements (20) are disposed offset from the stator yokes (19), in particular by one half the yoke spacing.

24. The machine according to claim 14, wherein the radial gap distance between the stator yokes (19) and the rotor rings (14, 15) on the one hand and the radial gap distance between the yoke elements (20) and the rotor rings (14, 15) on the other are the same size.

25. The machine according to claim 14, wherein the free end faces (194) of the yoke legs (191, 192) of the stator yokes (19) have at least the same axial width as the rotor rings (14, 15) and preferably protrude beyond the latter on one or both sides.

26. The machine according to claim 14, wherein the width of the stator yokes (19) and the width of the yoke elements (20), each measured in the rotation direction, are approximately the same.

27. The machine according to claim 14, wherein the ratio of the tooth width (b_{ZR}) of the teeth (18) on the rotor rings (14, 15) to the width (b_{ZS}) of the stator yokes (19) and yoke elements (20), each viewed in the rotation direction, is selected to be greater than 1 and less than 2, preferably less than or equal to 1.5.

28. The machine according to claim 14, wherein the yoke elements (20) are U-shaped, each with two short legs (201, 202), which are disposed radially opposite a rotor ring (14, 15), and a crosspiece (203), which connects these legs to each other.

29. The machine according to claim 28, wherein the free end faces (204) of the short legs (201, 202) of the yoke elements (20) have at least the same axial width as the rotor rings (14, 15) and preferably protrude beyond them on one or both sides.

IN THE ABSTRACT

Please substitute the attached Abstract of the Disclosure for the abstract as originally as filed.

REMARKS

The above amendments are being made to place the application in better condition for examination.

Entry of the amendment is respectfully solicited.

Respectfully submitted,

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Page 12, replace the abstract for the following amended abstract of the disclosure:

ABSTRACT OF THE DISCLOSURE

In a unipolar transversal flux machine, in particular a motor, having a rotor, which is comprised of two coaxial, ferromagnetic, toothed rotor rings, and a permanent magnet ring, which is magnetized in an axially unipolar fashion and is clamped axially between these rotor rings, and having a stator, which is concentric to the rotor shaft and has U-shaped stator yokes that represent the magnet poles, yoke elements, and a stator winding, in order to achieve an extremely flat design and to assure a definite start in a particular direction, the stator winding is embodied with two coils, whose one coil side extends respectively over a group of stator yokes and yoke elements arranged in succession in the circumference direction, along the side of the yoke elements remote from the rotor shaft, between the yoke legs, where the group spanned by the coil side of the one coil is disposed spatially offset on the stator circumference and electrically offset by 90° in relation to the group spanned by the coil side of the other coil.

VERSION WITH MARKINGS TO SHOW CHANGES

IN THE SPECIFICATION

Page 1, paragraph [0001] has been amended as follows:

[0001] Field of the Invention [Prior Art]

paragraph [0002] has been amended as follows:

[0002] The invention is directed to an improved [based on a] unipolar transversal flux machine.

Page 2, paragraph [0005] has been amended as follows:

[0005] SUMMARY OF THE INVENTION [Advantages of the Invention]

paragraph [0008] has been amended as follows:

[0008] BRIEF DESCRIPTION OF THE DRAWINGS

paragraph [0009] has been amended as follows:

[0009] An exemplary embodiment of the invention [shown in the drawings] will be explained in detail in the description that follows[.] , taken with the drawings, in which:

Page 3, paragraph [0013] has been amended as follows:

[0013] DESCRIPTION OF THE PREFERRED EMBODIMENT [Description of the Preferred Embodiment]

Page 5, paragraph [0017] has been amended as follows:

[0017] The stator winding 21 is comprised of two identical coils 22, 23, in this case kidney-shaped ones (Fig. 1), each with two coil sides 221, 222 and 231, 232. The one coil side 221 or 231 of each coil 22 or 23 extends coaxial to the rotor axis or the rotor shaft 13 and extends over a group of stator yokes 19 and yoke elements 20 arranged in succession in the circumference direction, where the coil side 221 or 231, on the side of the yoke elements 20 remote from the rotor shaft 13, extends through between the yoke legs 191 and 192 of the stator yokes 19. Each group has an equal number of stator yokes 19 and yoke elements 20 arranged in succession in the circumference direction, which in the exemplary embodiment totals six stator yokes 19 and six yoke elements 20. In this connection, the upper group spanned by the coil side 221 of the coil 22 is disposed electrically offset by 90° at the circumference in relation to the lower group spanned by the coil side 231 of the coil 23, each group containing a total of twelve stator yokes 19 and yoke elements 20. In Fig. 1, this is shown by the fact that the yoke elements 20 of the lower group spanned by the coil side 231 are radially aligned with the teeth 18 of the rotor 12, while the yoke elements 20 in the upper group spanned by the coil side 221 are offset in the circumference direction from the teeth 18 of the rotor 12. With a tooth count of sixteen and therefore a tooth division of 22.5°, the offset of the two groups of stator yokes 19 and yoke elements 20 in relation to each other is 5.626° of circumference angle. The other coil side [221] <u>222</u> or 232 of the coil 22 or 23, on the outside of the stator yokes 19 remote from the rotor shaft 13, extends over their crosspieces 193, likewise coaxial to the rotor shaft 13, and is shaped like a segment of a circle, the same as the coil sides 221 and 231.

Page 12, the abstract has been amended as follows:

[Abstract] ABSTRACT OF THE DISCLOSURE

In a unipolar transversal flux machine, in particular a motor, having a rotor [(12)], which is comprised of two coaxial, ferromagnetic, toothed rotor rings [(14, 15)], and a permanent magnet ring [(16)], which is magnetized in an axially unipolar fashion and is clamped axially between these rotor rings [(14, 15)], and having a stator [(11)], which is concentric to the rotor shaft [(13)] and has U-shaped stator yokes [(19)] that represent the magnet poles, yoke elements [(20)], and a stator winding [(21)], in order to achieve an extremely flat design and to assure a definite start in a particular direction, the stator winding [(21)] is embodied with two coils [(22, 23)], whose one coil side [(221, 231)] extends respectively over a group of stator yokes [(19)] and yoke elements [(20)] arranged in succession in the circumference direction, along the side of the yoke elements [(20)] remote from the rotor shaft [(13)], between the yoke legs [(19)], where the group spanned by the coil side [(221)] of the one coil [(22)] is disposed spatially offset on the stator circumference and electrically offset by 90° in relation to the group spanned by the coil side [(231)] of the other coil [(23) (Fig. 1)].